

## ABSTRACT OF THE DISCLOSURE

[0069] A positive displacement pump includes a magnetostrictive actuator. A single actuator drives multiple pumping chambers. The pump may include two  
5 pumping chambers driven in phase by the linear expansion of the actuator at both its ends. The pump may include a third pumping cavity, driven by the transverse expansion and contraction of the actuator, out of phase with either cavity driven by the lengthwise extension of the actuator.  
10 A pump assembly having multiple pumps each including a magnetostrictive element is also disclosed.